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OVER OR UNDER-DETECTION? A COMPARISON OF EXERCISE AND EUCAPNIC VOLUNTARY HYPERPNOEA CHALLENGES IN THE EVALUATION OF EXERCISE-INDUCED BRONCHOCONSTRICTION

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Background: The most appropriate objective bronchoprovocation challenge in the evaluation of exercise-induced bronchoconstriction (EIB) remains debated. Standardising minute ventilation and environmental conditions during an exercise challenge test (EX) is challenging, whereas it has recently been proposed that eucapnic voluntary hyperpnoea (EVH) may be overly sensitive. The primary aim of this study was therefore to compare the airway response to EX in a dry environment (25% RH) and EVH. An evaluation of current and revised diagnostic thresholds was undertaken to determine the impact of any proposed modification to EIB screening outcome.

Methods: In randomised order, sixty-three recreational athletes (male: $n = 47$) (training 9 ± 4 hrs/week) attended the laboratory on two separate occasions to complete either an EX challenge (6-min high-intensity cycling exercise at $>80\%$ max heart rate) in an environmental chamber (16°C , 25% relative humidity), and a EVH challenge (6-min maximal ventilation of a dry compressed gas mixture: 21% O_2 , 5% CO_2 , N_2 balanced). Spirometry was performed at baseline and 3, 5, 7, 10 and 15 minutes post challenge test in accordance with international guidelines. A positive diagnosis was defined by $\geq 10\%$ fall in FEV_1 at two consecutive time-points for both EX and EVH and $\geq 15\%$ fall in FEV_1 at one time-point for EVH.

Results: The mean fall in lung function following EVH ($-7.9 \pm 6.9\%$) was greater in comparison to EX (-1.9 ± 7.1 ; $P < 0.01$). A moderate positive correlation was observed between tests ($\rho = 0.46$, $P < 0.01$), however the mean bias was 6.1% and the data exhibited wide limits of agreement ($+5.3$ to -17.5%). Thirteen (21%) participants had a $\geq 10\%$ fall in FEV_1 following EVH, of which five were positive to EX. Nine (14%) participants had a $\geq 15\%$ FEV_1 fall following EVH, of which four were positive to EX.

Conclusion: Our findings indicate that EVH consistently induces a greater fall in FEV_1 in comparison to EX. Applying a 10% fall in FEV_1 cut-off for EVH results in greater diagnostic sensitivity, whereas a 15% fall in FEV_1 cut-off improves diagnostic specificity. Future population-based research evaluating the normative response to indirect bronchoprovocation in athletes remains a priority.